

*Koellia flexuosa* (Walt.) MacM.; *Sanguisorba Canadensis* L.; *Polygala viridescens* L.; *P. verticillata* L.; *Rhexia Virginica* L.; *Dipsacus sylvestris* Huds.; *Baptisia tinctoria* (L.) R. Br., nearly out of flower; *Cuscuta arvensis* L.; *Spiraea salicifolia latifolia* Ait.; *Iva frutescens* L.; *Panicum virgatum* L.; *Rynchospora glomerata* (L.) Vahl and *Apios Apios* (L.) MacM.—S. H. B.

## REVIEWS

### THE "PEG" OR "HEEL" IN SEEDLINGS OF THE CUCURBITACEAE

For many years that curious adaptive structure known as the "peg" or "heel" which serves to open the seedcoat in seedlings of the cucurbits has been an object of study for many investigators. The extent to which this has been the case is indicated by the extraordinary number of papers which have been devoted to it, namely 531!

The last of these is from the laboratory of the Agricultural Academy at Bonn, by Professor F. Noll.\* The very interesting and important results of the investigation are given below in the form of a partial translation:

As shown by Darwin, the structure in question is produced at the point of union of hypocotyl and root. Its lower half is therefore morphologically root, and the upper half stem. Qualitatively, the axis at this point is able to produce the peg on all sides. On the broad flanks of the axis, which in transverse section is elliptical, the peg develops more strongly than on the narrow flanks. Quantitatively, therefore, the axis differs in this regard in different regions of the sensitive zone.

The development of the peg, which is for the greater part confined to one side of the axis, occurs in response to two kinds of stimuli.

1. Its localized origin is on the one hand dependent on the stimulus of gravitation, and is formed on the under side. By reversing a sufficiently young seedling, a second peg may be called out on the opposite side.

\* Zur Keimungs-Physiologie der Cucurbitaceen. Landwirtschaftliche Jahrbücher. 1901. 145-165. Ergänzungsband I.

If the axis is placed in a vertical position, the stimulus of gravitation is still effective in that it produces an outgrowth which completely surrounds the axis. When the latter is placed more than  $6^\circ$  out of the vertical, no peg is formed upon the upper side.

The formation of the peg is the result of a peculiar and until recently unrecognized method of geotropic reaction in that the stimulus sets up a growth at right angles to the normal direction of growth, the polarity of which is displaced through an angle of  $90^\circ$ . This change is accompanied in the peg-forming region by a substitution of periclinal for anticlinal divisions.

2. On the other hand the formation of the peg is conditioned by the bending of the axis, in such a manner that it occurs on the concave side of the curve. In other words, as in the analogous case of the formation of secondary roots on the convex side of the curve of a primary root, the stimulus is derived from the organism itself, and is connected with its form. By appropriate experiment it is possible to separate the two stimuli, and thus to cause two outgrowths to appear on opposite sides.

Pressure and friction of the axis on the testa do not act as stimuli.

Under natural conditions the two stimuli, thus recognizable experimentally, work together in complete harmony with the result that the seedling is successfully freed from the testa at the right time. This process is most successful when the broad faces of seed are placed at right angles to the vertical; and least successful when the micropylar end is directed downwards.

The final throwing off of the testa, which prevents independent nutrition, occurs usually after 10–14 days without the help of the peg. Climatic conditions naturally affect the results favorably or unfavorably. Continuous high temperature of the substratum prevents the effective working of the apparatus by inducing a too sudden and rapid lengthening of the hypocotyl.

In planting, therefore, the seeds of cucurbits should be placed with a broad face directed downward, and the temperature of the substratum should not be kept too high.

It may be added that the nature of the stimuli, which, as indi-

cated above, are related to the form of the organism, is very obscure.—FRANCIS E. LLOYD.

## CORRESPONDENCE

EDITOR OF TORREYA.

*Dear Sir:* The attention of the Natural Science Committee of the Associate Alumnae of the Normal College has been called to the article which appeared in the August number of TORREYA, entitled "Vanishing Wild Flowers." In that article the work of the Committee is spoken of at considerable length, and inasmuch as it is mentioned in such reprehensible company that the mere statements without explanation might lead the reader to mistaken conclusions, the Committee respectfully requests that you will kindly publish the following in your next issue :

Could the school children have the opportunity "to learn to know the flowers by name and enjoy them" as the writer of "Vanishing Wild Flowers" suggests, there would be no need of our work at all. Unfortunately, the facts are that thousands of children never have that opportunity as the following statistics prove. Out of a class of fifty-five only one knew the clover; of a class of thirty-four three did not know the daisy, twelve the dandelion; of another class seven did not know the buttercup, and of a class of thirty-five not one knew a violet. From data carefully collected we found that forty per cent. of one entire school had never been to the country and twenty-five per cent. had never even visited Central Park. It is for these unfortunates that we hold our flower shows.

The commonest flowers are wonderful to them and we make special efforts to get these in quantity and also the flowers mentioned in the poems studied in school. It was for the latter reason that we were anxious to obtain the fringed gentians. We would like to state that those mentioned in the article in question were collected in the course of a long drive, were carefully cut, and only a few were taken from each locality.

Likewise, the pitcher plants referred to were gathered from a deserted cranberry bog at Plymouth, Mass., where the supply